Introduction to Botany. Lecture 16

Alexey Shipunov

Minot State University

October 3rd, 2011

Outline

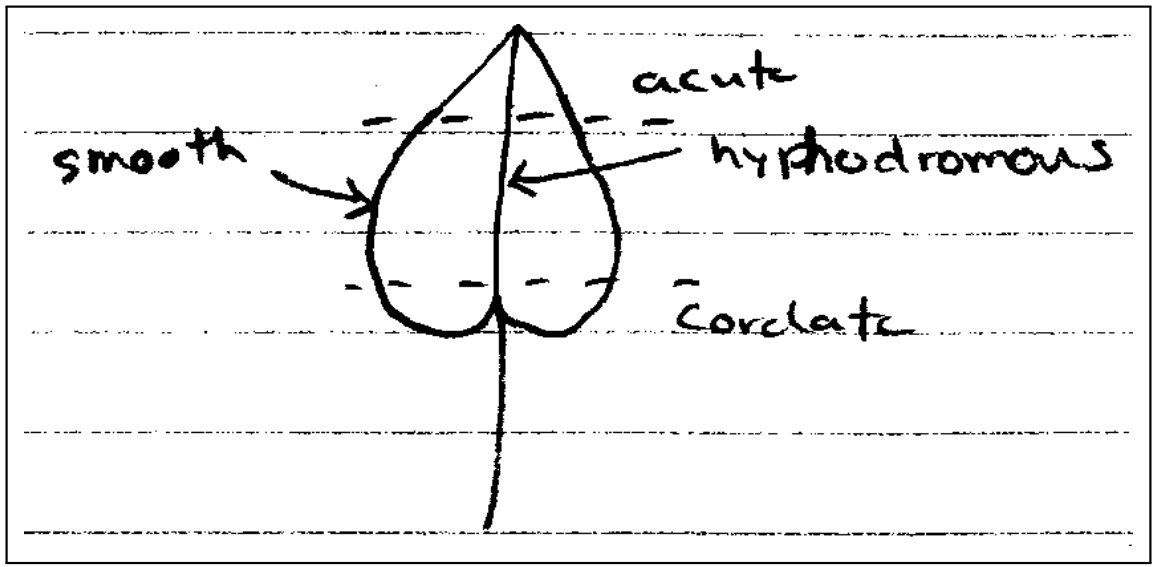
Outline

Previous final question: the answer

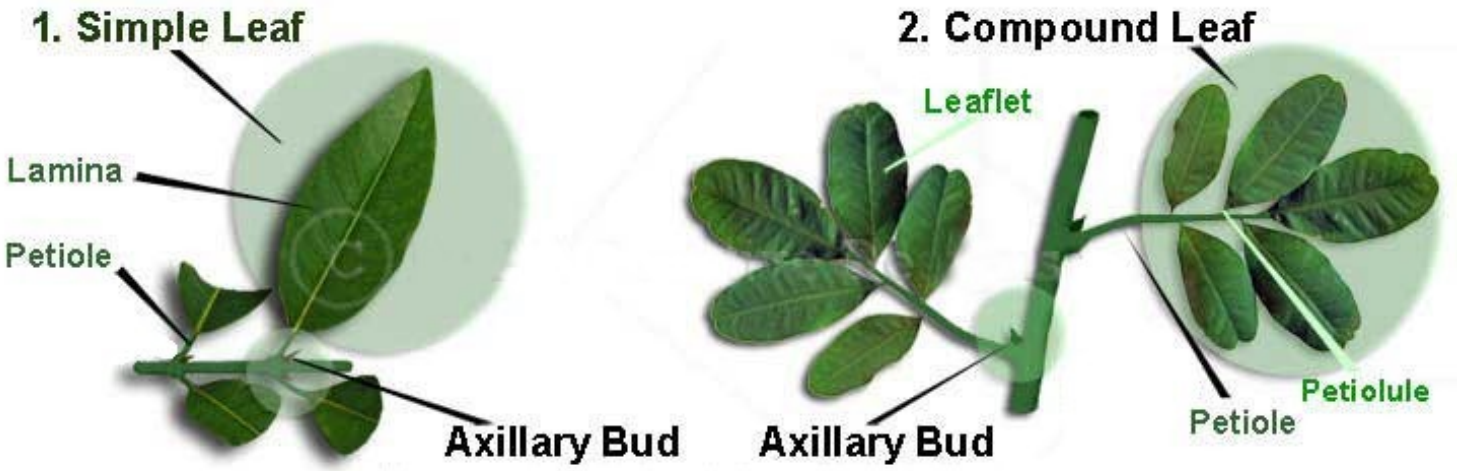
Please draw the **entire** (not dissected), **ovate** leaf with **acute** apex, **cordate** base, **smooth** margin and **hyphodromous** venation.

Previous final question: the answer

Please draw the **entire** (not dissected), **ovate** leaf with **acute** apex, **cordate** base, **smooth** margin and **hyphodromous** venation.



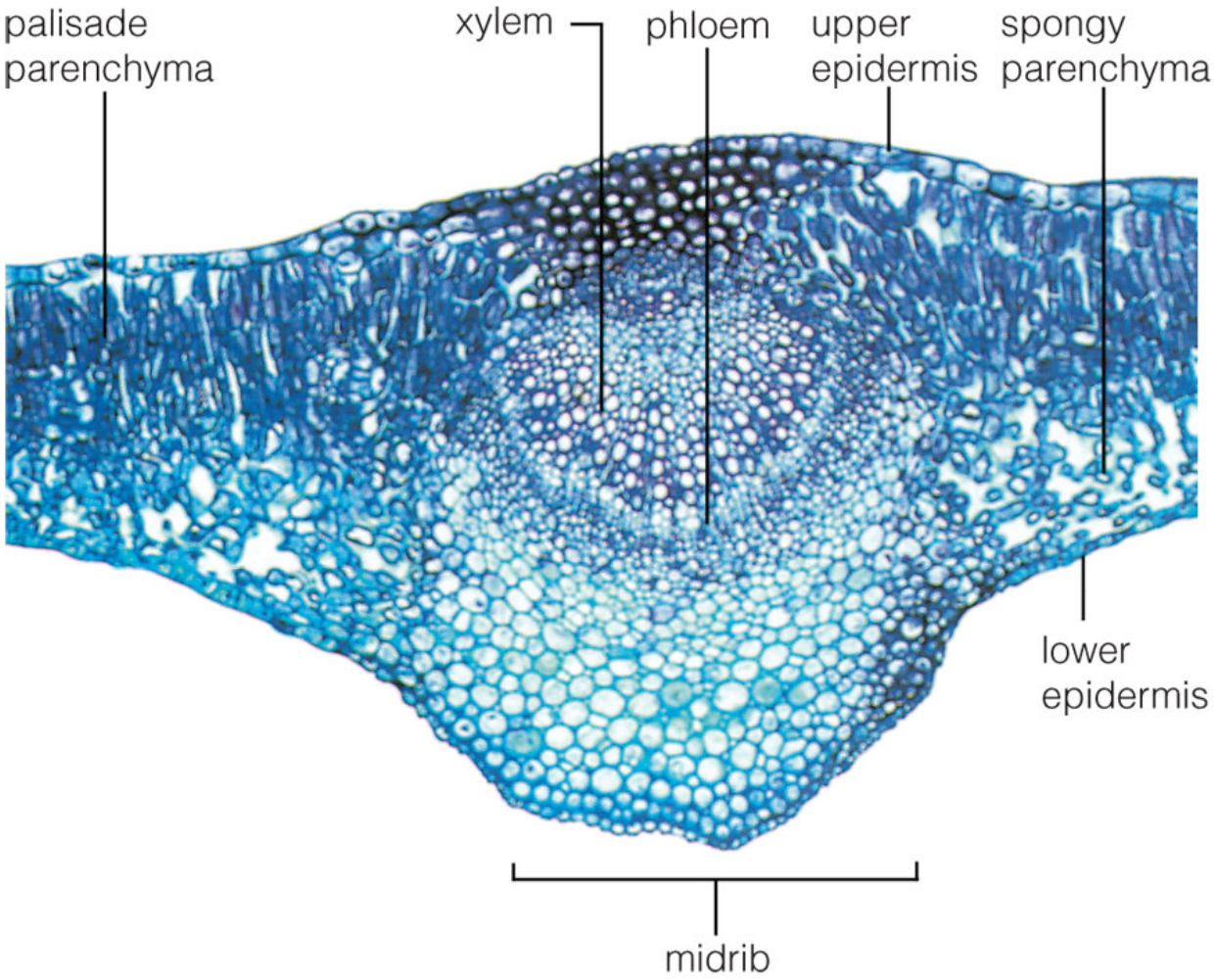
The remainder: simple and compound leaves



General leaf anatomy

- Epidermis with stomata
- Mesophyll
- Vascular bundles, or veins

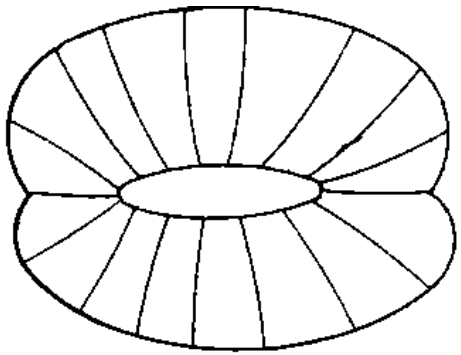
Lilac (*Syringa vulgaris*) leaf in cross-section

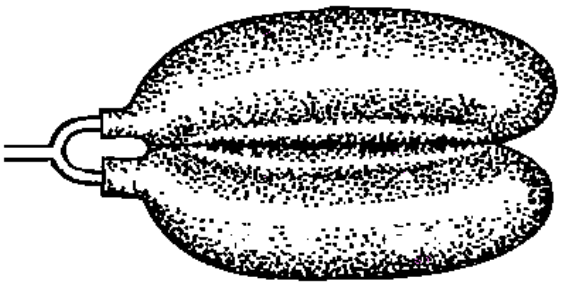


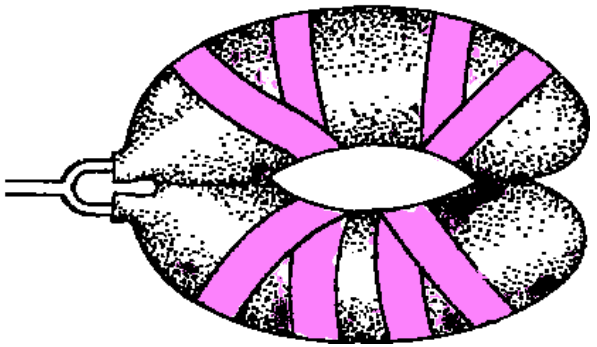
Epidermis and stomata

- Covered with cuticle
- Include stomata with guard cells and (often) subsidiary cells and trichomes
- Opening of stomata is a result of exchange of K^+, osmosis and uneven cell wall
- Lower epidermis in most cases contain more stomata

Stomata as balloons



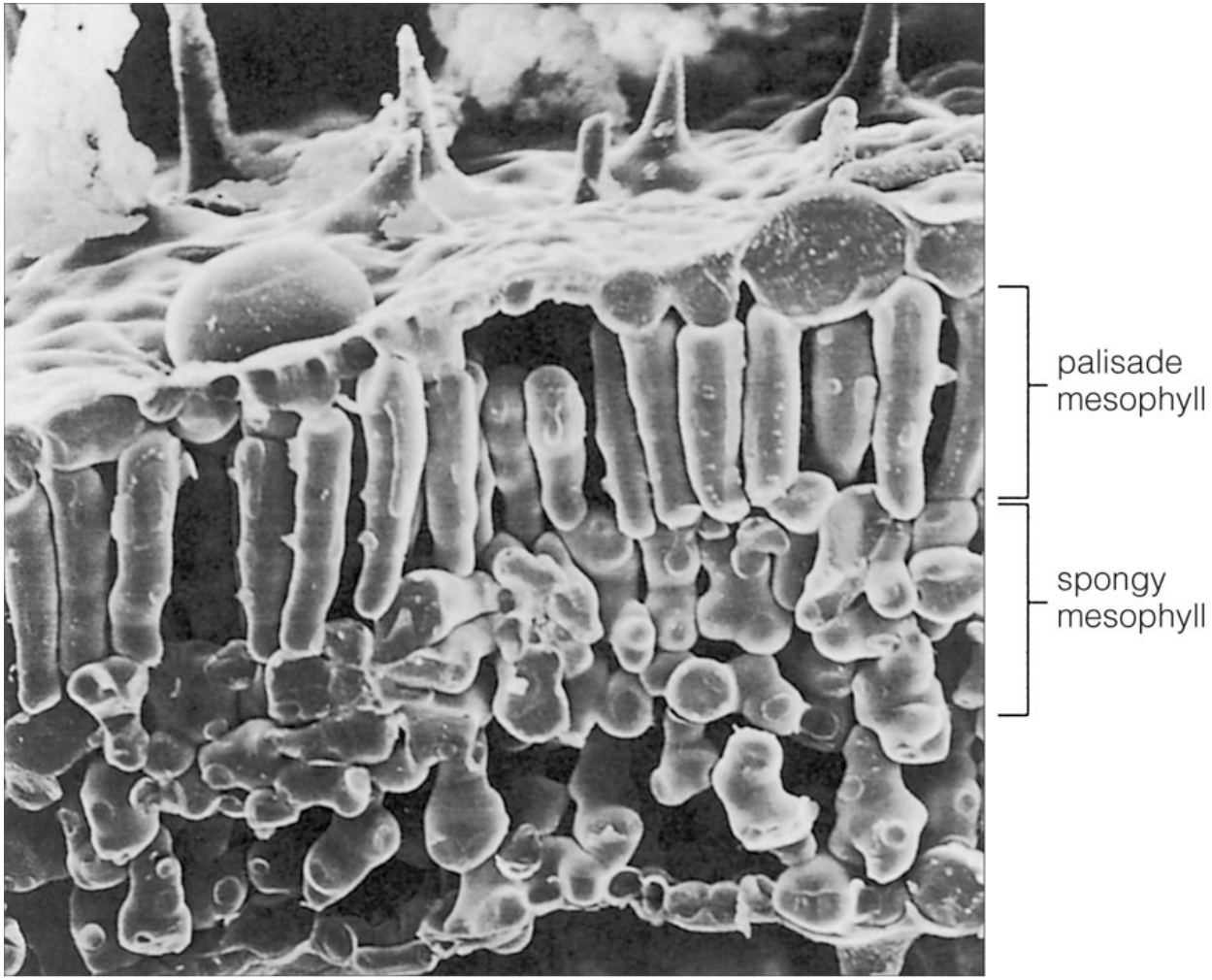




Mesophyll

- Palisade mesophyll consists of tightly arranged elongated cells with less chloroplasts
- Spongy mesophyll consists of loosely attached cells rich of chloroplasts

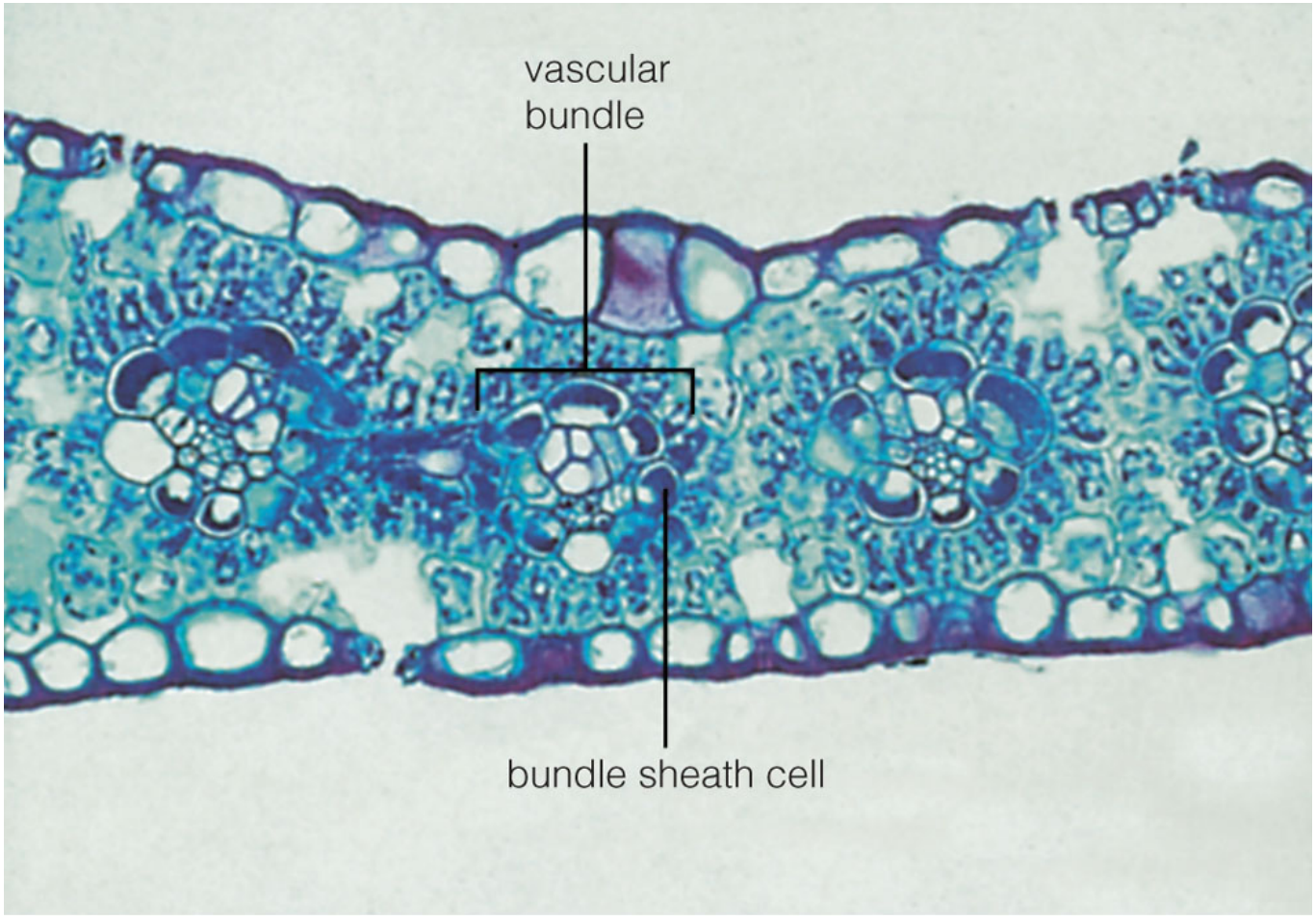
Palisade and spongy cells



Veins/vascular bundles

- Phloem typically faces downwards, xylem—upwards
- Bundles of C_4-plants have additional bundle sheath cells

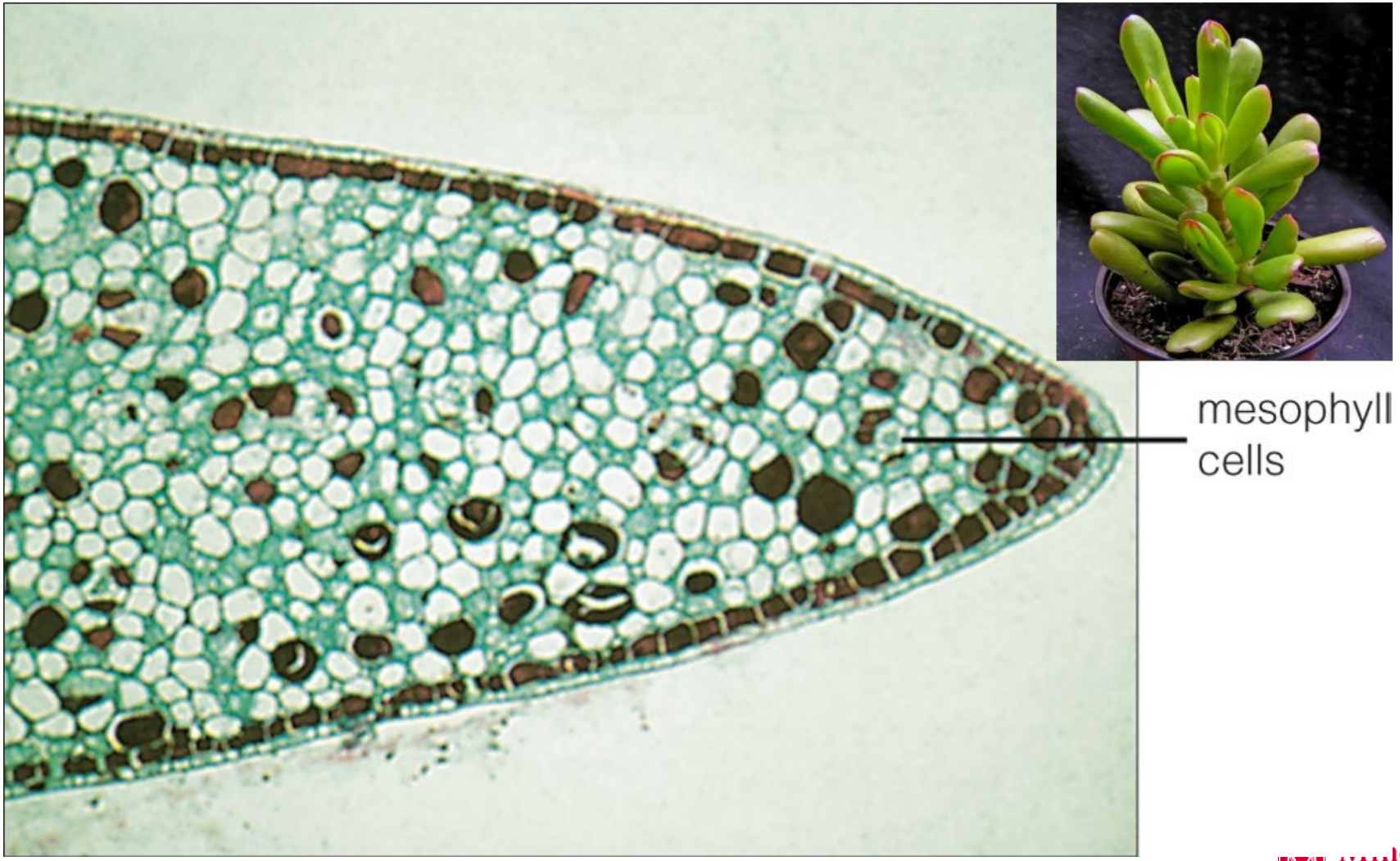
Bundle sheath cells



Plants and water

- Xerophytes: sclerophytes and succulents (stem and leaf)
- Mesophytes
- Hygrophytes
- Hydrophytes

Leaf succulent (*Crassula argentea*)

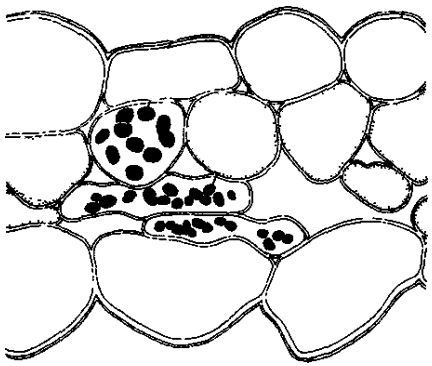


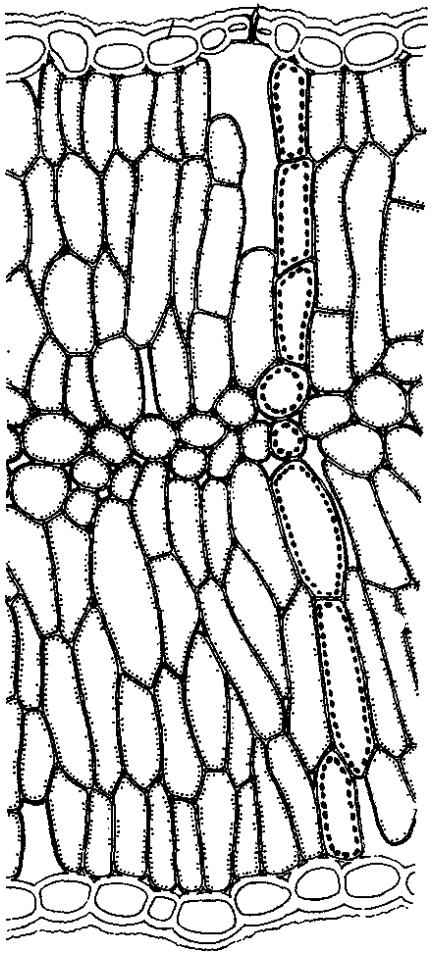
Xerophyte leaf—needle of pine (*Pinus contorta*)

Plants and light

- Sciophytes
- Heliophytes

Sciophyte and heliophyte





Oxalis acetosella and *Sylphium laciniatum*

Plants and soil

- Halophytes (accumulate, excrete or avoid NaCl)
- Nitrate halophytes (grow on soils rich of $NaNO_3$)
- Oxylophytes (grow on acidic soils)
- Calciphytes (grow on chalk soils rich of $CaCO_3$)

Leaf of salt-accumulating halophyte

Atriplex prostrata

Plants and substrate

- Psammophytes (grow on sand)
- Petrophytes (grow on rocks)
- Rheophytes (grow in fast springs)

Rheophyte

Rhyncholacis penicillata from Venezuela

Plants and methabolism

- Mycoparasites
- Hemiparasites
- Phytoparasites (root and stem)

Mycoparasite

Triuris hyalina from South America

Hemiparasite

Krameria parvifolia from southern Texas

Root parasite

Hydnora africana from South Africa

Stem parasite

Cuscuta europaea from Germany

Summary

- *Osmotic processes in guard cells* result in opening and closing of stomata
- The differentiation of mesophyll to **palisade** and **spongy** cells helps to acquire different types of light rays

Any questions before the exam?

Final question (3 points)

Final question (3 points)

Please invent a test question for the second exam (**subject**: root, stem or leaf).
There should be at least **three** exclusive choices.

Best questions will really go to the exam!

For Further Reading

J. E. Bidlack, Sh. H. Jansky.
Stern's introductory plant biology. 12th edition.
McGraw-Hill, 2011.
Chapter 7.

Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
Chapter 6.